CALCULADORA DE LA HUELLA DE CARBONO DE LOS RESIDUOS

CO_2 ZW

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2. ¿Por qué CO_2 **ZW** ?
3. Aspectos básicos de CO_2 **ZW**
4. La herramienta CO_2 **ZW**
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1. INTRODUCCIÓN

A escala global, el sector de los **residuos** tiene una **contribución relativamente pequeña a las emisiones** de gases de efecto invernadero (GEI) (3-5% en 2005).

No obstante, el sector de los residuos se encuentra en una **posición única** para pasar de ser una pequeña fuente de emisiones globales a ser un **gran ahorrador de emisiones**.

La **prevención** y **recuperación** de los residuos (**material y/o energética**) evita emisiones en otros sectores de la economía.

Waste and Climate Change. Global Trends and Strategy Framework
UNEP (2010)

2. ¿POR QUÉ CO_2 ZW ?

Necesidad de desarrollar una **herramienta de cálculo** de las emisiones de **gases de efecto invernadero** asociadas a la **gestión de los residuos**, que reúna las siguientes **características**:

• fácil de utilizar e intuitiva

• aplicable a distintos niveles administrativos (municipio, región, país…)

• que permita obtener resultados con una disponibilidad variable de datos de entrada.

• que contemple los dos principales enfoques para el cálculo de las emisiones de los vertederos controlados (principal amenaza del sector)

En el marco del proyecto

"Low Cost **Zero Waste** Municipality"

(1G/MED08-533 ZERO WASTE)

CO_2 ZW

Carbon Footprint Tool for Waste Management in Europe

¿Qué es?

Herramienta de cálculo de la huella de carbono de la **gestión y tratamiento de los residuos**

¿Quién puede usarla?

Cualquier usuario (gestores de residuos, consultores, académicos) que disponga de **datos actualizados de la gestión de residuos** y, especialmente, las administraciones locales de Eslovenia, España, Grecia e Italia.

¿Cómo?

Aplicativo Excel® disponible gratuitamente *(próximamente).*

Lengua: inglés (herramienta de uso en el contexto europeo)

¿Para qué?

- Para **monitorizar e informar** de las emisiones de gases de efecto invernadero de los residuos.
- Esto puede ser útil para **guiar las políticas de gestión de residuos** locales y nacionales

¿Qué impactos se consideran?

Transporte

Tratamiento

¿Qué fracciones e instalaciones?

Residuos urbanos o municipales

	RESTO	ORGÁNICA	VIDRIO	PAPEL Y CARTÓN	METAL	PLÁSTICO
TMB*	X	X				
COMPOSTAJE		X				
DIGESTIÓN ANAEROBIA		X				
VERTEDERO	X					
INCINERACIÓN	X					
TRIAJE Y/O AFINO			X	X	X	X

**Incluye dos tipos de TMB y preparación de CDR*

¿Cómo se calculan las emisiones?

• **Método IPCC** (*Guidelines for National Greenhouse Gas Inventories*) para la degradación de la materia orgánica y la combustión de residuos

• **Datos sectoriales** de consumo de energía así como eficiencias de las instalaciones (p.e. recuperación de materiales)

• **Bases de datos** (p.e. ecoinvent) para la cuantificación de impactos

El usuario puede introducir datos locales según disponibilidad para ajustar los cálculos a su realidad

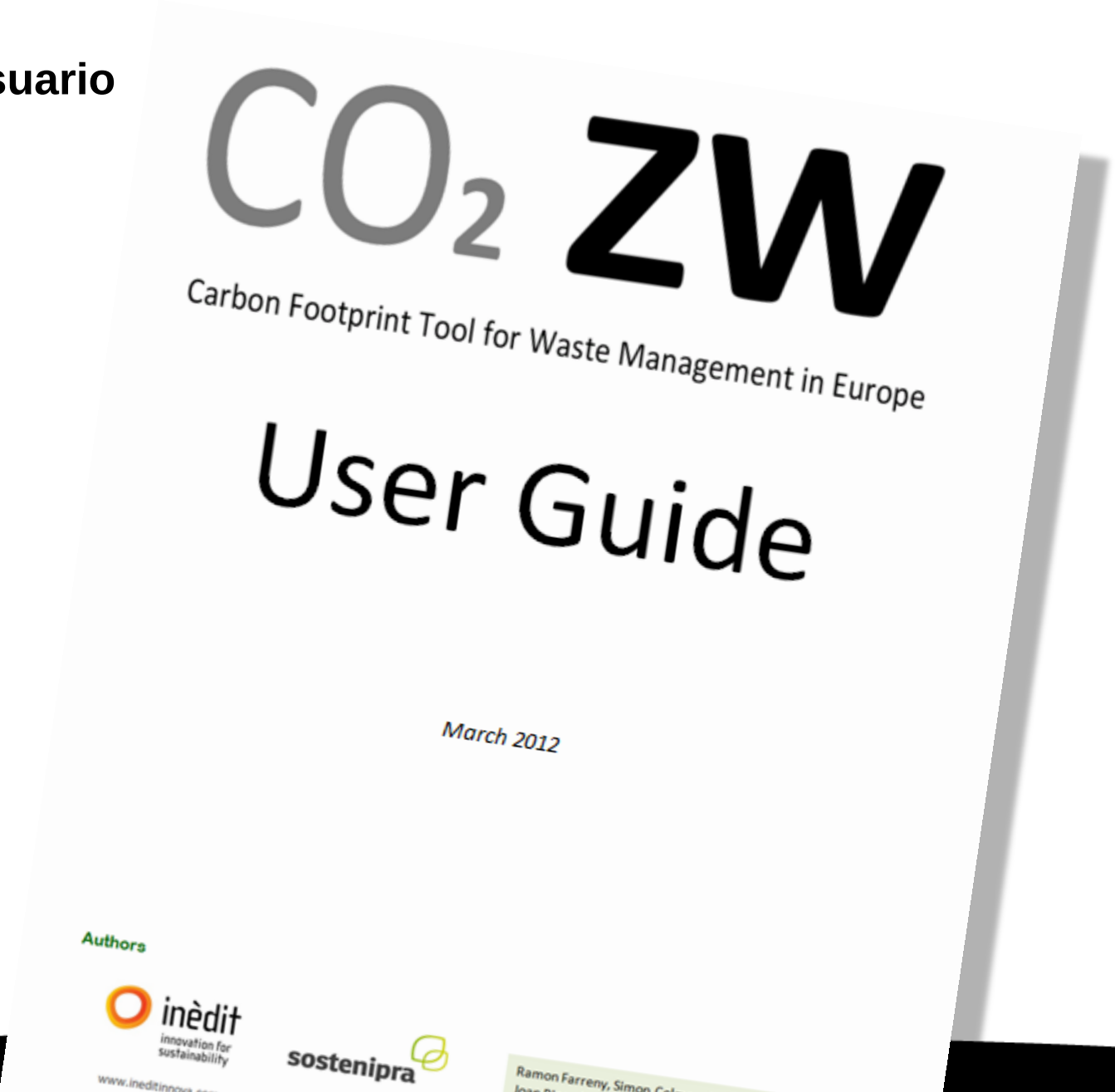
El manual de usuario

CO_2 **ZW** es una herramienta fácil de utilizar, que requiere que el usuario siga un orden lógico para la entrada de datos.

No obstante, se acompaña de un **manual de usuario** que incluye:

- instrucciones de uso
- notas metodológicas

El manual de usuario



CO_2 ZW

Carbon Footprint Tool for Waste Management in Europe

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Click here to view ZeroWaste partners and collaborators

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¿Qué pasos se deben seguir?

Paso 1. Sistema de estudio

Paso 2. Descripción del sistema

Paso 3. Composición de los residuos

Paso 4. Indicadores de referencia

Paso 5. Parámetros clave

Paso 6. Método de cálculo de las emisiones del vertedero

Paso 7. Créditos valorización material y energética

¿Qué pasos se deben seguir?

• A lo largo de los diferentes pasos, el usuario introduce los **datos disponibles** en las celdas correspondientes (tipo **cuestionario**).

• En caso de desconocimiento de un dato, se utilizarán **valores por defecto** obtenidos de diferentes fuentes bibliográficas.

• Valores por defecto disponibles a nivel nacional para Eslovenia, España, Grecia, Italia (partners del proyecto) y europeos según datos más recientes

Ejemplo datos por defecto

	Emisiones mix eléctrico (kg CO2/kWh)	Captación biogás vertedero(%)
Grecia	**1.03**	**60.0%**
Italia	**0.65**	**48.1%**
Eslovenia	**0.50**	**36.8%**
España	**0.24**	**17.2%**
Europa	**0.50**	**38.7%**

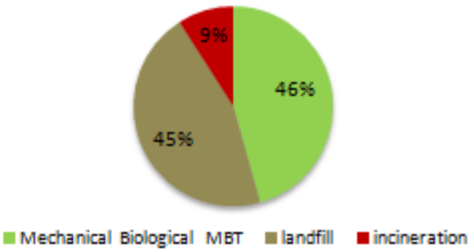
1. Sistema de estudio

Select your **COUNTRY**	Spain

Country profile (informative)

Waste generation (Kg/capita·day)	1.69
Collection of source-separated materials	13.4%

Mixed waste destination



Indicate the name of the **study area** (municipality, region, ...)	*Please write here*
Indicate the **study year**	*Please write here*

2. Descripción del sistema

Total waste generation

Waste generation

Is data on the total amount of municipal waste generated in the study area available?

(●) Yes

Introduce the total **amount of municipal waste generated** in the study area (t/year)	*Please write here*

( ) No

Introduce the population in the study area (inhabitants)	*Please write here*
Estimated amount of municipal waste generated in the study area (t/year)	*0*

2. Descripción del sistema

Mixed General Waste flows

Destination of mixed was

Is data on the destination of mixed general waste in the study area available?

○ Yes

Mixed General Waste destined for **Mechanical Biological Treatment (MBT) plant - type 1** (%)	*Please write here*
Mixed General Waste destined for **MBT plant - type 2** - composting (%)	*Please write here*
Mixed General Waste destined for **MBT plant - type 2** - anaerobic digestion (%)	*Please write here*
Mixed General Waste destined for **Incineration** (%)	*Please write here*
Mixed General Waste destined for **Landfill** (%)	*Please write here*
Total Mixed General Waste destined for the several treatment options (%)	*0.0%*

Please make sure that the total amounts to 100%

◉ No

2. Descripción del sistema

Collection of source-separated materials

Waste source-separatio

If data on the amount of source-separated collected materials is available, introduce it in the corresponding cells. Please, leave the other cells unaltered
If you have entered data and you wish to revert to the default values, please reenter *Please write here* in the corresponding cells.

	Select units: *ton/year*
Collection of source-separated **glass**	*Please write here*
Collection of source-separated **plastic**	*Please write here*
Collection of source-separated **metals**	*Please write here*
Collection of source-separated **paper and cardboard**	*Please write here*
Collection of source-separated **organic matter**	*Please write here*
Collection of other source-separated **materials**	*Please write here*

2. Descripción del sistema

Collection of source-separated materials

Organic matter destination

Is data on the destination of source-separated organic matter in the study area available?

○ Yes

Source-separated organic fraction destined for **MBT (composting)** (%)	*Please write here*
Source-separated organic fraction destined for **windrow composting** (%)	*Please write here*
Source-separated organic fraction destined for **tunnel composting** (%)	*Please write here*
Source-separated organic fraction destined for **MBT (biomethanization)** (%)	*Please write here*
Source-separated organic fraction destined for **biomethanization plant** (%)	*Please write here*
Total source-separated organic fraction destined for the several treatment options (%)	*0.0%*

Please make sure that the total amounts to 100%

◉ No

2. Descripción del sistema

Characteristics of Waste Treatment Plants

Waste treatment plant

If data on the following treatment plants is available, please introduce it where appropriate. Please, do not alter the remaining cells.

Recycling installations

Recycling efficiency of source-separated **glass** in recycling plant (%)	*Please write here*
Recycling efficiency of source-separated **plastic** in recycling plant (%)	*Please write here*
Recycling efficiency of source-separated **metals** in recycling plant (%)	*Please write here*
Recycling efficiency of source-separated **paper and cardboard** in recycling plant (%)	*Please write here*

Source-separated organic fraction treatment plants

Average compost production (% compost/organic fraction)	*Please write here*

2. Descripción del sistema

Characteristics of Waste Treatment Plants

MBT 2 (mixed solid waste line)

Recovery of materials (plastic, metals, paper…) (% of input waste)	*Please write here*
Net diversion of organic matter (% of the total organic matter in the waste input)	*Please write here*
Net organic matter recovery (in the form of biostabilised production) (% of input waste)	*Please write here*
Total residual waste (% of input waste)	*Please write here*

Residue from MBT plar

In case that there is waste destined for MBT, is data on the destination of the residual fraction from MBT in the study area available?

○ Yes

Residual waste to **landfill** (%)	*Please write here*
Residual waste to **incineration** (%)	*Please write here*
Residual waste to **Refuse Derived Fuel (RDF) production** (%)	*Please write here*
Total residual waste from MBT destined for the several treatment options (%)	*0.0%*

Please make sure that the total amounts to 100%

◉ No

2. Descripción del sistema

Transportation of waste

Waste transportation

Do you wish to include the carbon footprint from the transportation of waste? Note: Only select "Yes" if you have the relevant data available.

○ Yes

Introduce the amount of tkm (tons·kilometre) associated to all generated waste. Please, notice that there is a differentiation between urban waste collection (including compression systems, stops, etc.) and inter-urban transportation of waste (e.g. between waste transfer facility and MBT, or MBT and landfill). Please introduce a zero whenever you do not have data or you do not wish to calculate one of the two transportation subsystems.

Transportation of waste - urban waste collection (tkm)	*Please write here*
Default emission factor (g CO2eq/tkm)	1,310

The user may change the factor if more-specific data is available

Transportation of waste - inter-urban waste transportation (tkm)	*Please write here*
Default emission factor (g CO2eq/tkm)	124

The user may change the factor if more-specific data is available

◉ No

2. Descripción del sistema

System parameters (flows and efficiencies)	Example		
	%	t/year	Plant
1. MSW public collection (excluding green points and bulk wastes)		**1,250,423**	
2. Collection of source-separated materials, TOTAL	**13.4%**	**167,604**	
2.1. Collection of source-separated glass (G) as proportion of total G	43.2%	**37,238**	7
2.1.1. Net recycling rate of G	96.0%	35,749	
2.2. Collection of source-separated plastic (P) packaging as proportion of total P	11.4%	**15,096**	6
2.2.1. Net recycling rate of P	54.7%	8,257	
2.3. Collection of source-separated metals (M) as proportion of total M	18.9%	**9,737**	
2.3.1. Net recycling rate of M	54.7%	5,326	
2.4. Collection of source-separated paper and cardboard (P/C) as proportion of total P/C	22.5%	**59,645**	8
2.4.1. Net recycling rate of P/C	92.0%	54,874	
2.4.2. Residual waste to landfill from G, P, M & P/C recycling		17,510	
2.5. Collection of source-separated organic materials	7.1%	**38,898**	
2.5.1. Organic material destined for aerobic compost production		32,593	2b, 4 & 5
2.5.2. Organic material destined for biomethanization (including MBT2 & MBT3)		6,305	2a & 3
2.5.3. Compost production (in treatment plants 2b,3, 4 & 5)		2,678	
2.5.4. Residual waste to landfill (from treatment plants 2a, 2b, 3, 4 & 5)		9,060	
2.6. Collection of other source-separated waste materials	4.3%	**6,990**	
3. Mixed general waste destined for Mechanical-biological Treatment plant type 1 (MBT1)	**39.4%**	**426,414**	1
3.1. Materials recovered from the waste treated at MBT1	3.7%	15,777	
3.2. Net diversion of organic matter from the total organic matter in the waste input	80.0%	161,433	
3.3. Net organic matter recovery (ratio of biostabilised production against total waste input)	7.4%	31,725	
3.4. Total residual waste from MBT1	63.4%	270,347	
3.4.1. MBT1 residual waste to landfill	96.0%	259,533	10
3.4.2. MBT1 residual waste to incineration	4.0%	10,814	9
3.4.3. MBT1 residual waste to Refuse Derived Fuel (RDF) production	0.0%	0	11

3. Composición de los residuos

Municipal Solid Waste (total generation)

This is the typical composition of MSW for your selected country (in the case of "other" countries, the European average is assumed). These cells may be altered if more specific data pertaining to the study area is available, however it is important that the total sums to 100%.

Overall waste composition	Proportion of total MSW (%)	Biogenic carbon content	Low Heating Value (MJ/Kg)
Organic material	44.0%	100%	4.0
Paper and cardboard	21.2%	100%	11.5
Plastic	10.6%	0%	31.5
Glass	6.9%	0%	0
Metals	4.1%	0%	0
Wood	1.0%	100%	9
Textiles	4.8%	80%	14.6
Rubber and hide	1.0%	80%	27.2
Other	6.2%	0%	8.4
TOTAL	100%		

Source-separated collection

Please, indicate the impurities of the source-separated organic fraction (if available)

Impurities in organic fraction	20%

4. Indicadores de referencia

Total recycling rate	30%
Biodegradables to landfill (t)	412,052
Mixed general waste direct to landfill (t)	391,761

- ***Directiva de Residuos (2008/98/EC):***

  → recuperar/reciclar ≥ 50% en 2020

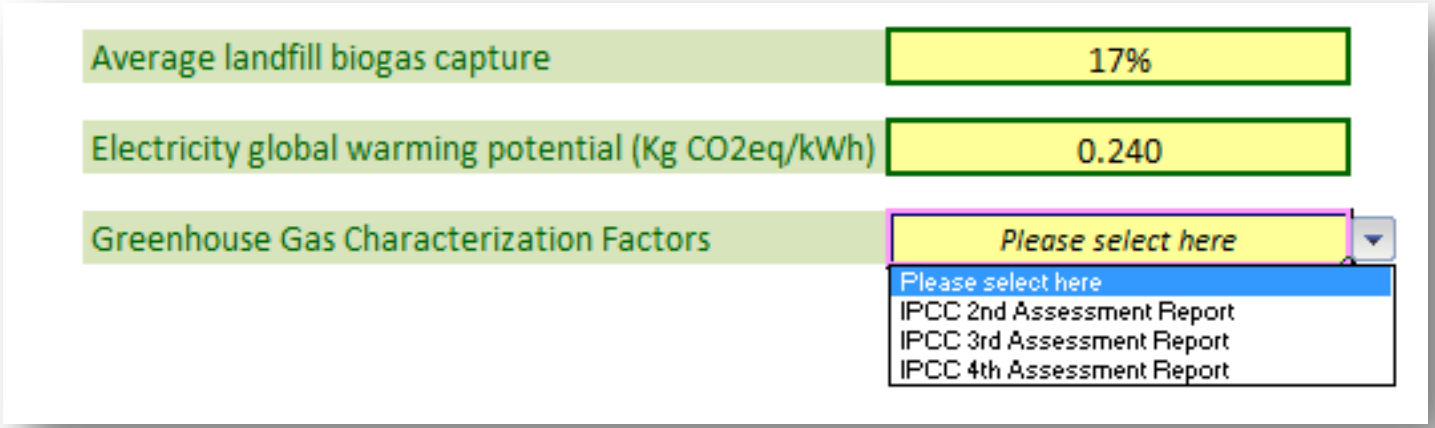
- ***Directiva de Vertidos (99/31/EC):***

  →reducir vertido residuos biodegradables al 35% de 1995 en 2020.

  → vertido residuo sin previo tratamiento = 0.

5. Parámetros clave

Estos parámetros condicionan fuertemente los resultados de huella de carbono



Gas	IPCC 1996	IPCC 2001	IPCC 2007
CO_2	1	1	1
CH_4	**21**	23	**25**
N_2O	310	296	298

6. Método de cálculo de las emisiones del vertedero

Option A

◯ IPCC Guidelines

Choose one of the following options

If you do have **data on the landfilled waste** in the case study area **for the last 50 years**:

You are encouraged to use the IPCC model to estimate the emissions from landfills	Please, click here to access the model
In that case, introduce the emissions from landfilling **after recovery** (t CH4)	*Please write here*

If you do **NOT** have data on the landfilled waste in the case study area for the last 50 years, or you prefer using **DEFAULT VALUES**,*

** Please, be aware that this selection has some limitations. For further information, read the User Guide*

Please, select baseline year	*Please select here*
GWP of landfilled waste for the study year (t CH4/t landfilled waste)	n.a.

Option B

◉ Future emissions of current landfilled waste

The future emissions of the landfilled waste of the study year will be estimated and included altogether in the results

Please, select the climate in the area of study	*Dry temperate*

6. Método de cálculo de las emisiones del vertedero

Opción A

6. Método de cálculo de las emisiones del vertedero

Opción B

7. Créditos valorización material y energética

Credits for material and energy recovery

Compost (mineral fertiliser substitution)	88 Kg CO2eq/t
Mixed metals	2,469 Kg CO2eq/t
Mixed plastics	1,653 Kg CO2eq/t
Paper and cardboard	634 Kg CO2eq/t
Glass	200 Kg CO2eq/t
Slag	3 Kg CO2eq/t
RDF for cement/thermal power plant	0 Kg CO2eq/t
RDF for cogeneration	0 Kg CO2eq/t
Heat	0.274 Kg CO2eq/kWht
Electricity	0.240 Kg CO2eq/kWhe

Carbon sequestration*

Compost (C fixation)	48 Kg CO2eq/t
Biostabilised product (C fixation)	48 Kg CO2eq/t
Landfill (C sequestration)	314 Kg CO2eq/t

Hoja de Resultados

RESULTS FOR Study Area ACCORDING TO DATA PROVIDED BY John Smith

TOTAL EMISSIONS	75.242 t CO2eq/year	Relative emissions	0,75 t CO2eq/ton·year

Table of results

Results expressed in t CO2 eq

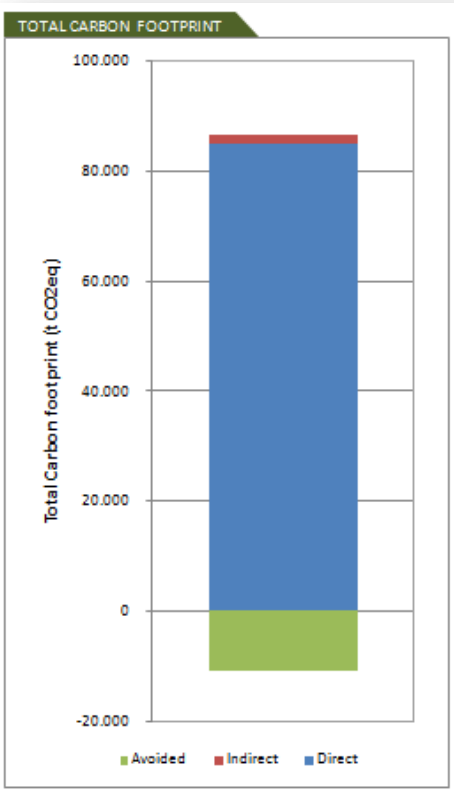
FLOWS OF WASTE	Quantity of waste (t/year)	DIRECT impact (A)	INDIRECT impact (B)	AVOIDED impact (C)	TOTAL EMISSIONS (A+B+C)	Sequestered emissions (informative)
TOTAL RECYCLING FROM SOURCE-SEPARATED COLLECTION		449	73	-5.548	-5.026	-10
Paper and Cardboard, Plastics, Glass and Metals	9.734	19	44	-5.497	-5.434	
Organic materials destined for aerobic compost production	2.607	418	19	-18	419	-10
Organic materials destined for anaerobic digestion	504	12	10	-33	-11	
TOTAL MIXED GENERAL WASTE TO MBT		3.394	692	-3.513	572	-134
Total waste processed at Mechanical Biological treatment (MBT) plants	39.548	3.394	692		4.085	
Mechanical Biological Treatment (MBT) outputs						
Credits for the recovery of materials and energy (without RDF production)				-3.513	-3.513	-134
Refuse Derived Fuels (RDF)			0	0	0	
TOTAL WASTE TO INCINERATION		3.236	164	-1.387	2.013	0
Incineration plant	8.843	3.236	164	-1.387	2.013	
TOTAL WASTE TO LANDFILL		77.829	454	-600	77.682	-20.551
Landfill	65.356	77.829	454	-600	77.682	-20.551
TOTAL		84.908	1.382	-11.048	75.242	-20.695

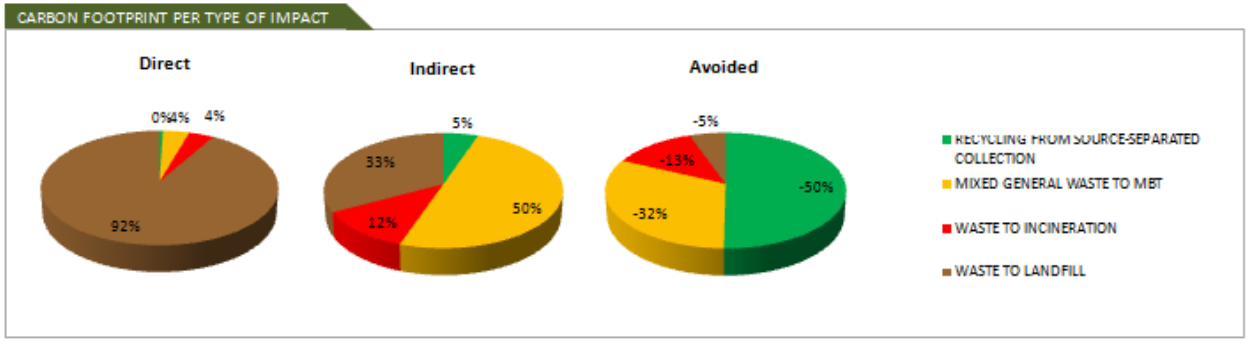
Transportation	n.a.

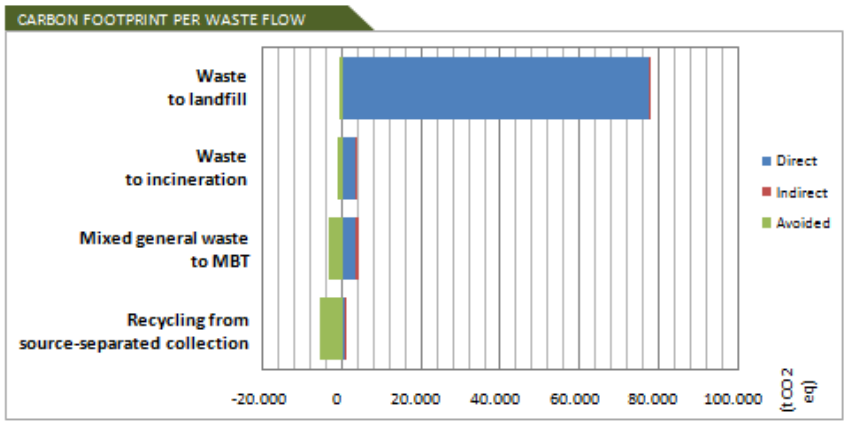
Hoja de Resultados

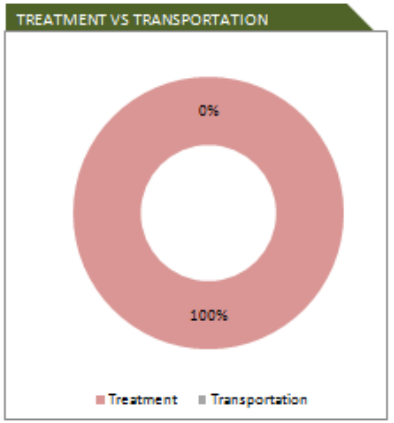
RESULTS FOR	Study Area	ACCORDING TO DATA PROVIDED BY	John Smith

TOTAL EMISSIONS	75.242 t CO2eq/year	Relative emissions	0,75 t CO2eq/ton·year









5. NOTAS FINALES

CO_2 ZW ...

… es una **herramienta fácil de utilizar** y de acceso libre para el cálculo de la huella de carbono del transporte y tratamiento de residuos urbanos

…proporciona una primera **aproximación a la huella de carbono** a partir de **datos básicos** (generación de residuos o población)

… permite obtener **resultados más precisos y ajustados** cuando el usuario dispone de **datos de calidad** (p.e. destino rechazos TMB, eficiencia instalaciones tratamiento)

→ **Herramienta muy flexible**

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CO_2 ZW

¡Gracias por vuestra atención!

inèdit innovation for sustainability

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